(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 848 130 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
17.06.1998 Bulletin 1998/25

(51) Int Cl.[6]: **E05G 1/10**, G08B 13/191, G08B 13/02, G07D 11/00

(21) Application number: **97309855.1**

(22) Date of filing: **08.12.1997**

(84) Designated Contracting States:
AT BE CH DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **11.12.1996 GB 9625659**

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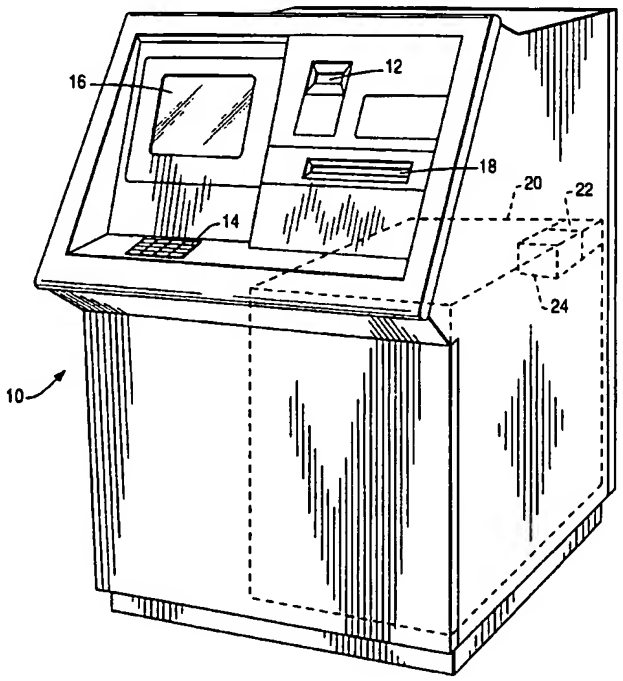
(54) Improved safe

(57) A safe (20) for an ATM comprises a layer of piezoelectric or pyroelectric material, and contains electrical circuitry (24) to sense a mechanical or thermal attack on the safe. The safe also contains response means such as a silent alarm (26) connected by radio to an external security centre; an audible alarm (28) and a dye spray (30). A neural network (22) is connected to the circuitry, and is trained to distinguish between different types of attack on the ATM (e.g. a casual kick or several hammer blows) and to activate the appropriate response means. Preferably said layer is polyvinylidene fluoride, which has both piezoelectric and pyroelectric properties.

FIG. 1



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Description

This invention relates to a safe for storage of valuables.

It is known to provide a safe in the form of a heavy lockable enclosure, often of steel, and often with one or more sensors to detect an attack on the safe, by sensing heat, sound, vibration or movement; the physical resistance of the safe is the source of such signals which are detected by respective different sensors.

A disadvantage of such safes is that positions of the sensors become known to criminals, so that they can be disarmed, e.g. by cutting or tampering with wiring, selecting a preferred attack method depending on the known type of sensor, or otherwise disabling the alarms.

It is an object of the invention to provide a safe having an alarm system which is less easily bypassed than existing alarm systems.

According to the invention there is provided a security enclosure comprising a hollow body; electrical signal sensing means contained within the hollow body; and response means to respond to an attack on the enclosure, characterized in that the hollow body comprises a material which provides an electrical signal in response to an attack.

Said material may be a layer of a piezoelectric material which will provide electrical signals in response to mechanical attacks, or a layer of a pyroelectric material which will provide electrical signals in response to thermal attacks, or a combination. Advantageously, the material is a layer of polyvinylidene fluoride (PVDF) which responds to both mechanical and thermal attacks.

Preferably there is also provided discrimination means to determine the type of attack on the safe, and in response to some types of attack to select at least one of a plurality of response means. The discrimination means may for example be a neural network.

It is an advantage of a safe according to the invention that it is impossible to disable the response to an attack on the safe without opening the safe.

The invention will now be described by way of example only with reference to the accompanying drawings in which:-

Figure 1 is a view of a safe according to the invention incorporated in an automated teller machine (ATM); and

Figure 2 illustrates the operation of the safe.

In Figure 1 an ATM 10 has a card insertion slot 12, a keypad 14, a display screen 16, and a cash delivery slot 18. Within the ATM is a safe 20 enclosing the currency-containing parts (not shown) of the ATM such as currency cassettes. Within the safe is a computer 22, connected to electrical signal sensing circuitry 24.

The walls of the safe 20 are constructed of a composite which includes a layer of PVDF; the PVDF may be sandwiched between inner and outer layers or may itself form the inner wall of the safe. The other layer or layers of the composite may be metal or plastics material or both. If the safe is attacked physically, e.g. by hammer blows or with a thermal tool, the wall under attack generates an electric current which is sensed by the circuitry 24; an attack on the casing of the ATM 10 generates a smaller current. The circuitry 24 provides an indication of the current level to the computer 22.

The computer 22 incorporates a neural network which is trained to recognise different types of attack on the safe 20. For example, if someone kicks the ATM 10, one type of electrical signal will be generated by the safe 20, while if it is hit with a hammer, a different type of signal arises. The neural network can then act appropriately, such as a) giving no response to a kick; b) silently alerting the police or a security centre in response to a single hammer blow; and c) initiating an audible alarm, and a dye spray to mark the stored currency, in response to several hammer blows. Such an intelligent response is more effective than a simple threshold detection and response system, and will provide fewer false alarms. Thus, for example, the police will only be warned of any genuine attacks, and currency will only be disabled by dye-marking when the ATM is under serious threat.

Figure 2 shows the electrical sensing system 24 connected to a neural network 22, which controls a silent alarm 26, which provides a radio signal to a security centre, an audible alarm 28, such as a bell or siren, and a dye spray 30.

As an alternative to the use of a layer of PVDF alone as the sensor, there may also be provided an additional layer of a pyroelectric material which will provide a further signal in response to a thermal attach, additional to the pyroelectric response of the PVDF layer.

A safe according to the invention can be used in any circumstances when secure storage of valuables is required.

The use of a polymeric material even as part of a composite construction provides a safe which is less physically resistant to attack than a steel safe; however many grades of steel safe are required to resist attack for a relatively short period, e.g. 30 minutes. The fact that a safe according to the invention constitutes an alarm system which cannot be by-passed has the advantage of ensuring that an alarm signal is always provided, giving an early indication of a serious attack.

Claims

1. A security enclosure comprising a hollow body (20); electrical signal sensing means (22,24) contained within the hollow body; and response means (26,28,30) to respond to an attack on the enclosure, characterized in that the hollow body (20) comprises a material which provides an electrical signal in response to an attack.

2. A security enclosure according to claim 1, characterized in that said body (20) comprises a layer of a piezoelectric material.

3. A security enclosure according to claim 1, characterized in that said body (20) comprises a layer of pyroelectric material.

4. A security enclosure according to claim 1, characterized in that said body (20) comprises a layer of polyvinylidene fluoride.

5. A security enclosure according to any preceding claim, characterized by comprising a plurality of different response means (26,28,30).

6. A security enclosure according to claim 5, characterized in that the response means include a silent alarm (26), an audible alarm (28) and banknote disable means (30).

7. A security enclosure according to claim 6, characterized in that the electrical signal sensing means (22,24) is arranged to distinguish between different types of attack on the enclosure, and to activate a selected one or more response means (26,28,30) in accordance with the type of attack.

8. A security enclosure according to claim 7, characterized by comprising a computer (22) connected between the electrical sensing means (24) and the response means (26,28,30).

9. A security enclosure according to claim 8, characterized in that the computer comprises a neural network (22).

FIG. 1

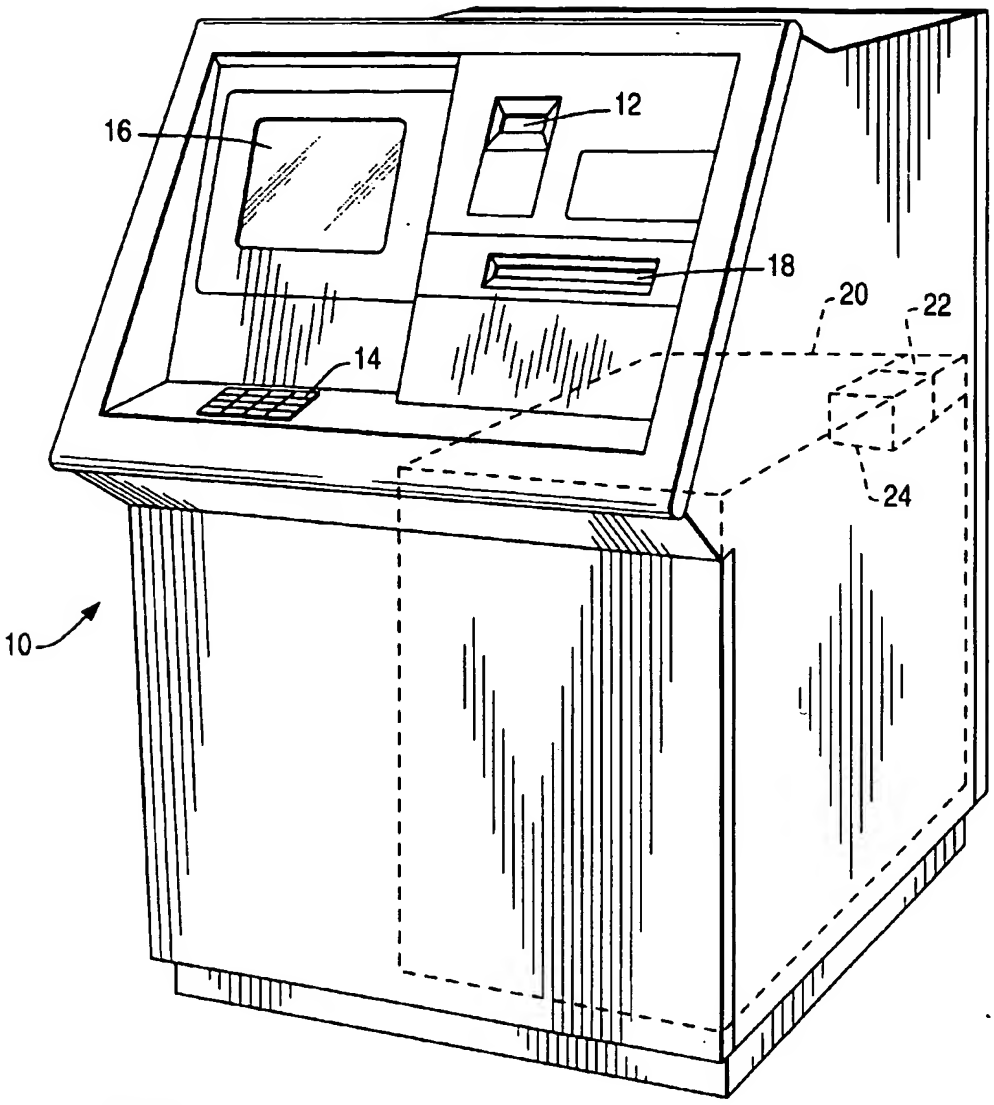
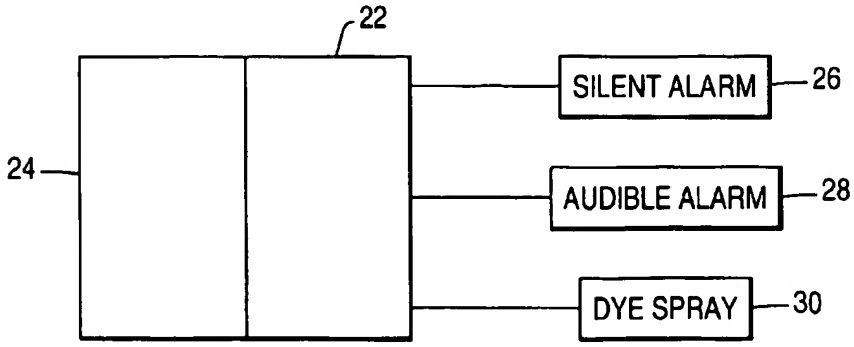

16
12
18
20
22
14
24
10

FIG. 2


22
24
SILENT ALARM
26
AUDIBLE ALARM
28
DYE SPRAY
30